APPENDIX B7

Using Math Journals in the GED Classroom

> *Knowing mathematics is doing mathematics. We need to create situations where students can be active, creative, and responsive to the physical world. I believe that to learn mathematics, students must construct it for themselves. They can only do that by exploring, justifying, representing, discussing, using, describing, investigating, predicting, in short by being active in the world. Writing is an ideal activity for such processes.*
>
> Joan Countryman, ***Writing to Learn Mathematics*** (1992)

Writing activities can help students better understand the material they are trying to learn and ultimately can shift students from looking at math as a series of formulas that have to be solved or computations that must be completed to recognizing that mathematics is a process. Most GED students do not recognize that mathematics is a process; rather, they see each problem with a specific answer and no real relationship among the wide range of problems that they encounter in the classroom, on tests, or in the real world.

Math journals can be used for many purposes. The GED teacher should look at math journals as variables rather than constants, providing opportunities for students to:

- Increase their feelings of confidence in being able to learn and use mathematical concepts and skills to solve a wide range of problems and thus help alleviate math anxiety.
- Be more aware of what they do and do not know.
- Make use of their own prior knowledge when solving new problems.
- Identify their own questions about an area with which they are less familiar.
- Develop their ability to think through a problem and identify possible methods for solving it.
- Collect and organize their thoughts.
- Monitor their own progress as they gain higher-level problem-solving skills and are able to work with more complex problems.
- Make connections between mathematical ideas as they write about various strategies that could be used for problem solving.
- Communicate more precisely how they think.

In *Writing in the Mathematics Curriculum* (Burchfield, Jorgensen, McDowell, and Rahn 1993), the authors identify three possible categories for math journal prompts. These categories include:

- Affective/attitudinal prompts, which focus on how students feel.
- Mathematical content prompts, which focus on what the material is about.
- Process prompts, which require students to explain what they are thinking and doing.

Using Affective/Attitudinal Prompts in Math Journals

Many adult learners are math phobic or, at least, fearful of trying and failing to solve problems. Their own feelings of inability to learn mathematics get in their way and, in essence, become a self-fulfilling prophecy. The more anxious the learner becomes, the less he/she is able to focus on the math content. Affective/attitudinal math journal prompts enable students to express their feelings, concerns, and fears about mathematics. The following are a few examples of affective/attitudinal prompts:

- Explain how you feel when you begin a math session.
- One secret I have about math is…
- If I become better at math, I can…
- My best experience with math was when…
- My worst experience with math was when…
- Describe how it feels if you have to show your work on the board…
- One math activity that I really enjoyed was…

Using Mathematical Content Prompts in Math Journals

When working with math content, most adult learners expect merely to perform a series of computations and provide a specific answer. Rarely have they been asked to explain what they did to find an answer. Mathematical content prompts provide learners with an opportunity to explain how they arrived at a specific answer, thus enabling them to begin making connections between what they have done and the math content itself. These types of prompts also enable students to support their point of view or to explain errors they made in their calculations. Mathematical content prompts can be as simple as students writing definitions in their own terms, such as defining geometric shapes or providing math examples of what variables are and why they are used. The following are a few examples of mathematical content prompts:

- The difference between … and … is…
- How do you…?
- What patterns did you find in…?
- How do you use … in everyday life?
- Explain in your own words what … means.
- One thing I have to remember with this kind of problem is…
- Why do you have to…?

Using Process Prompts in Math Journals

Process prompts allow learners to explore how they go about solving a problem. It moves them from mere computations to looking at math problem solving as a process that, just as in solving real-life problems, requires a series of steps and questions that must be analyzed and answered. Process prompts require learners to look more closely at how they think. The following are examples of process prompts:

- How did you reach the answer for the problem about…?
- What part in solving the problem was the easiest? What was the most difficult? Why?

- The most important part of solving this problem was…
- Provide instructions for a fellow student to use to solve a similar problem.
- What would happen if you missed a step in the problem? Why?
- What decisions did you have to make to solve this type of problem?
- When I see a word problem, the first thing I do is…
- Review what you did today and explain how it is similar to something you already knew.
- Is there a shortcut for finding…? What is it? How does it work?
- Could you find the answer to this problem another way?
- I draw pictures or tables to solve problems because…
- To solve today's math starter, I had to…
- The first answer I found for this problem was not reasonable, so I had to…

It is recommended that GED teachers incorporate math journals in their instructional program. Teachers should assign students a math writing activity on a regular basis, switching among the categories identified above. Teachers do not have to respond to each journal activity, but should review students' writing on a regular basis. Teachers should avoid general comments that do not provide adequate feedback, but rather focus on the mathematics within the journal entries and make comments related to the thinking/reasoning used and, if appropriate, offer additional suggestions for further thought. It is also important to schedule time to talk with students individually about their journal entries and how they feel about the progress they are making. Teachers may also set up and use a scoring rubric for math journal entries. In *Writing in the Mathematics Curriculum,* Burchfield, Jorgensen, McDowell, and Rahn recommend the following four-point scoring rubric:

Score	Descriptor
A	Response is coherent and well structured. Ideas are communicated clearly. Math topics are communicated clearly.
B	Response is coherent and adequately structured. Ideas are communicated fairly well.
D	Response is incomplete. Ideas are somewhat incoherent and ambiguous. Ideas are written in fragments.
F	No response or ideas are completely irrelevant and inadequate.

Material Adapted From

Math Journals for All Ages. Retrieved July 24, 2006, from http://math.about.com/aa123001a.htm.

Burchfield, P.C., Jorgensen, P.R., McDowell, K.G., and Rahn, J. (1993). *Writing in the Mathematics Curriculum.* Retrieved July 24, 2006, from http://www.geocities.com/kaferico/writemat.htm.

Countryman, J. (1992). *Writing to Learn Mathematics.* Portsmouth, NH: Heinemann.

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